

Precise Smart Track

Indoor tracking and communication system for First Responders

Project Proposal

for BIRD Foundation *Homeland Security Technologies*

Proprietary Notice

This document and the information contained in it are proprietary of and confidential information of Elbit Systems and Navigation Solutions LLC. No person is allowed to copy, reprint, reproduce or publish any part of it nor disclose its contents to others, nor make any use of it, nor allow or assist others to make any use of it, unless by the prior express written authorization of Elbit Systems and Navigation Solutions LLC then only to the extent authorized.

© Copyright Elbit Systems & Navigation Solutions LLC 2020

Project Proposal Cover Page

To: Israel-U.S. Binational Industrial Research and Development Foundation

From: Israeli Company: Elbit Systems C4I and Cyber LTD

Office Address -

2 Hamashev st. Netanya

42507 Israel

Telephone No. +972-773603810

Fax No. +972-98898233

Mailing Address -

Dima.volovich@elbitsystems.com

From: U.S. Company: Navigation Solutions, LLC

Office Address -

2489 Bunker Hill Rd

Ann Arbor, MI 48105

Telephone No. +1-734-2235904

Fax No. +1-734-6479379

Mailing Address -

lojeda@imuwear.com

Project Title: Precise Smart Track Indoor tracking and communication system for First Responders.

Project Duration: 18 months

Project Budget: \$ 2M

Submitted by: **Israeli Company**
Authorized Company Official

Signature:

Printed Name: Cohen Yossi

Title: CTO,
Elbit Systems C4I and Cyber

E-mail: Yosef.Cohen@elbitsystems.com

Date Submitted: 23nd Sep. 2020

Submitted by: **U.S. Company**
Authorized Company Official

Printed Name: Lauro Ojeda

Title: CEO

E-mail: lojeda@imuwear.com

Date Submitted: 23nd Sep. 2020

Table of Contents

C.	Executive Summary	4
C.0	Preface	5
C.1	Abstract:	5
C.2	Company Background	5
C.3	The Innovation	6
C.4	Collaborative Relationship	8
C.5	Commercial Potential:	9
	Calendar year:	9
	Target market size for developed product (M\$):	9
	Estimated market share (%): (*)	9
	Estimated sales quantity (units):	9
	Estimated representative unit price (\$/unit/Year):	9
	Estimated sales revenue (K\$):	9
	Estimated cumulative sales revenue (K\$):	9
D.	The Innovation	9
E.	Proposed R&D Program	14
E.1	Analysis of the Problem	14
E.2	Proposed Approach	14
E.3	Analysis of the Project's TRL	26
F.	Program Plan.....	27
G.	The Market.....	28
H.	Commercialization - Plans and Prospects	29
H.1	Product Manufacturing, Marketing and Sales Activities	29
H.2	Cash Flow Analysis	29
I.	Cooperation, Economic and Social Benefits	30
J.	Organization and Management Plan.....	31
J.1	Resumes of Key Personnel.....	32
K.	The Companies and their resources.....	35
L.	Project Budget	36
M.	Risk Analysis.....	36
N.	Sundry Information- Mandatory	37
O.	Certificates of Incorporation	38

C. Executive Summary

	<i>Israeli Company</i>	<i>U.S. Company</i>
Full company name (as appears on the Certificate of Incorporation)	Elbit Systems C4I and Cyber LTD	Navigation Solutions LLC
Company locations (headquarters and relevant division address, including full street address, state, city, zip code)	2 Hamashev st. Netanya 42507 Israel	2489 Bunker Hill Rd Ann Arbor, MI 48105
Company website	www.elbitsystems.com	www.imuwear.com
Year established	2007 (2019 as C4I and Cyber)	2006
Revenues: most recent fiscal year 2019	\$546 Million	\$ 0.12 Million
Increase / (Decrease) over previous year	9%	400 %
Number of employees	1518	5
Ownership Structure (public, private, main investors, etc.)	Private	Private
Percentage ownership of the company by the other company	0%	0%
Relationship of the companies – - Parent/Subsidiary - Common Ownership - No common relationship - Other	No common relationship	
Number of previous BIRD projects	1	0

Israeli Company Registration Number	51-404628-3
U.S. Company DUNS Number	788610298

Expected project title	Precise Smart Track device for indoor tracking, and communication, at GPS denied environments
Estimated project budget	\$2M
Expected project duration	18 months

C.0 Preface

Elbit Systems C4I and Cyber Ltd (**Elbit**) from Israel and Navigation Solutions LLC (**NavSol**) from Michigan U.S are submitting their proposal to BIRD foundation for the 2nd time. We have tried to gain BIRD's approval last year without a success. During this challenging year, Elbit and NavSol have invested their own R&D funds to proceed with this program. The results helped us to make our proposal more attractive with lower risks.

We managed to gain the following outcomes during the last year:

- a. Elbit SmarTrack 2nd generation prototype with a smaller footprint and lower power consumption
- b. NavSol new inertial sensor, replacing the RT-WRD-001 device with the RT-Foot Tracking.
- c. Advanced field testing to the new prototypes for performance validation.

We are sure you will find our new proposal most attractive, as described below.

C.1 Abstract:

Tracking of task forces locations, operating in a GPS denied environment, was always an issue for mission command and control (C2) systems. Providing an accurate operational picture with emergency responder's locations, acting inside buildings and basements, requires an independent navigation system for each user and a way to collect all these location reports to the C2 system, for commander's decision support.

The need to alert these responders from close risks and hazards is also affected by the ability to track their precise location and to communicate through barriers, inside buildings.

Elbit and NavSol are planning to jointly develop the Precise Smart Track (**PST**) device, as a cost-effective solution for Indoor tracking, monitoring and communication system for first responders.

This revolutionary device will be based on the NavSol boot mounted Inertial Localization Module, performing pedestrian dead-reckoning, integrated into Elbit's indoor SmarTrack navigation and monitoring system, based on RF ranging in a mesh network topology, for precise location with a modified accuracy. The PST device will include a GPS receiver too for outdoor location.

C.2 Company Background

Elbit Systems C4I and Cyber

Elbit Systems Ltd. (ESL) is an international leading technology company engaged in a wide range of defense, homeland security and commercial programs throughout the world. The Company, which includes Elbit Systems and its subsidiaries, operates in the areas of aerospace, land and naval systems, command, control, communications, computers, intelligence surveillance and reconnaissance ("C4ISR"), unmanned aircraft systems, advanced electro-optics, electro-optic space systems, EW suites, signal intelligence systems, data links and communications systems, radios and cyber-based systems. The Company also focuses on the upgrading of existing platforms, developing new technologies for defense, homeland security and commercial applications and providing a range of support services, including training and simulation systems.

Elbit Systems C4I and Cyber, ESL subsidiary, is one of the world's leading companies in the field of developing and implementing advanced C4ISR systems, integrated intelligence and communication systems. The Company's proven solutions are operational and used by governmental agencies and armed forces around the world.

At Elbit Systems, providing mission critical solutions for those in the business of protecting and saving lives around the world is our core business and why we exist.

As a systems provider Elbit Systems has recently led in the US, through its subsidiary Elbit Systems of America (ESA), several successful Homeland Security programs:

- ✓ Integrated Fixed Tower (IFT) - border security program. ESA is deploying a network of tower infrastructure with Command and control centers along the rural areas of the southern Arizona border. This program is now modified with new technologies.
- ✓ Network Extension Program - DHS Science and Technology (S&T) Directorate successfully tested **WideBridge™** - Mission Critical Secure Broadband Services for First Responders at the Public Safety Communications Research (PSCR) Lab in Boulder CO, using FirstNet infrastructure.
- ✓ BIRD funded program for “Public Safety Off-Network Broadband Communications” with a U.S company M87. This program was ceased due to M87 transfer of control.

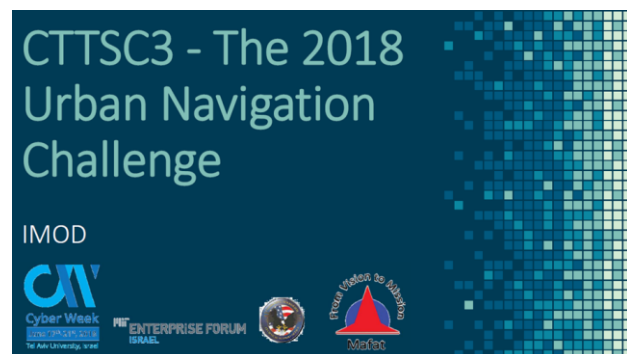
Navigation Solutions LLC

Navigation Solutions LLC (**NavSol**) is a spin-off from the University of Michigan. NavSol's founder has over 20 years of experience developing real-time motion tracking devices using inertial sensors.

NavSol was originally created as a consulting company that helped commercial companies solve challenging problems in indoor location domain and GPS denied environments. In 2016 NavSol revealed and started to commercialize its first version of personal location system - the RT-WRD-001.

This legacy device used a dedicated computer and sensor cables. Since the introduction of RT-WRD-001, NavSol has created several configurations of the personal tracking system. NavSol's newest product, the RT-BLE-001, provides a fully-integrated and self-contained solution in a tiny enclosure equivalent of 2 penny coins.

In October 2018, during the Urban Navigation competition organized by the US DoD and the Israeli MoD at the military training installations in Tzeelim, Israel. The NavSol personnel tracking solution has been successfully used by several companies and research institutions, including Elbit and US government agencies (DOD, DOE).



C.3 The Innovation

The current Elbit SmarTrack is all-in-one personnel- tracking device for complex environment with GPS denied reception. The SmartTrack features RF transceiver for RF ranging capabilities, an onboard GPS/Glonass receiver, and local data connectivity. The SmarTrack can be operated in any geographical operational indoor and outdoor environment, and serves as a Data Link to transmit essential C2 data between users.

The current SmarTrack system can calculate and monitor location of 4 to 100 network users simultaneously, non-line-of-Sight (NLOS), with a location accuracy better than three (3) meters in urban and indoor environments, given 3 devices as anchors.

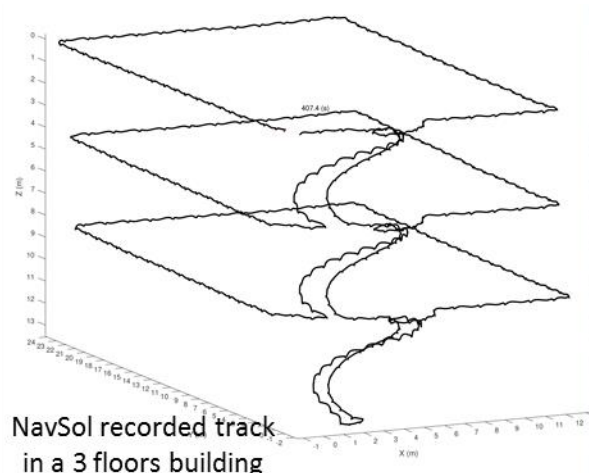




SmarTrack performance record with 20 users in a GPS denied environment

The NavSol **RT-Foot-Tracking** is a self-contained wireless personal localization solution. It contains an inertial measurement unit (IMU) for sensing kinematic motion, an onboard computer for performing location calculations in real-time, a Bluetooth low energy wireless for communication and a rechargeable battery that makes it portable.

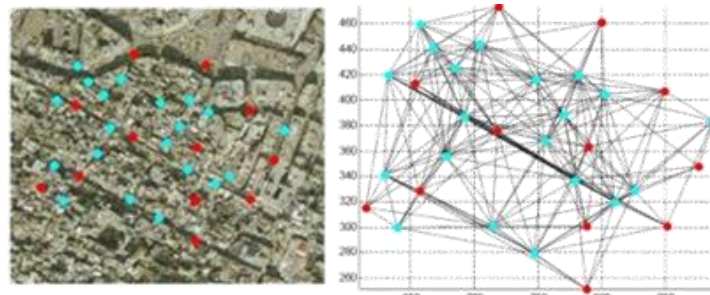
The NavSol system is capable of calculating a person location that drifts within 4% radius of the traveled distance, regardless of the environmental conditions. By combining the NavSol RT-Foot-Tracking, albeit affected by drift errors, with the Elbit SmarTrack absolute navigation ability, it will be possible to offer a solution for indoor and outdoor tracking with long-term precise location capabilities.



The fusion between Elbit RF based, virtual anchor, positioning algorithm and NavSol inertial-sensor measurements, aims to significantly improve the locations estimation accuracy.

The goal for these fused technologies is to be able to define the exact room and floor level the user is currently stays at, in a high-rise building, during a real-time mission (given the floors plan).

The user, equipped with **Precise Smart Track (PST)** device, will be able to report its location while being indoor and outdoor seamlessly. The task force locations will be displayed at the commander's terminal. The basic system capacity shall support a group of up to 100 concurrent users.



Precise Smart Track (PST) data routing topology

C.4 Collaborative Relationship

a) Development project phases:

Phase 1 - Expected Duration: 6 months

- NavSol:
 - ✓ Update RT-Foot-Tracking system electronics to industrial standards
 - ✓ Customize system communication interface
- Elbit:
 - ✓ Systems fusion Design
 - ✓ Commander's tracking application development

Phase 2 –Expected Duration: 12 months

- NavSol:
 - ✓ Upgrade BLE communication protocol
 - ✓ Assist with systems integration
 - ✓ Reduce power consumption
 - ✓ Improve RT-Foot-Tracking system accuracy
- Elbit:
 - ✓ SmarTrack fusion algorithm development and testing
 - ✓ Systems Integration & testing performance
 - ✓ Building commercial prototypes for demonstrations

b) Required project budget:

	BIRD funding portion	Non-Bird funding portion	Non-Bird funding source
Navigation Solutions	0.3M\$	0.3M\$	Internal R&D budget
Elbit Systems	0.7M\$	0.7M\$	Internal R&D budget
Total	1M\$	1M\$	

c) Sharing of profits:

Sharing of profits generated by selling the combined solution will be the basis for the agreement between the companies.

C.5 Commercial Potential:

Calendar year:	2021	2022	2023
Target market size for developed product (M\$):	50	100	150
Estimated market share (%): (*)	4	8	12
Estimated sales quantity (units):	5000	10000	15000
Estimated representative unit price (\$/unit/Year):	400	400	400
Estimated sales revenue (K\$):	2000	4000	6000
Estimated cumulative sales revenue (K\$):	2000	6000	12000

D. The Innovation

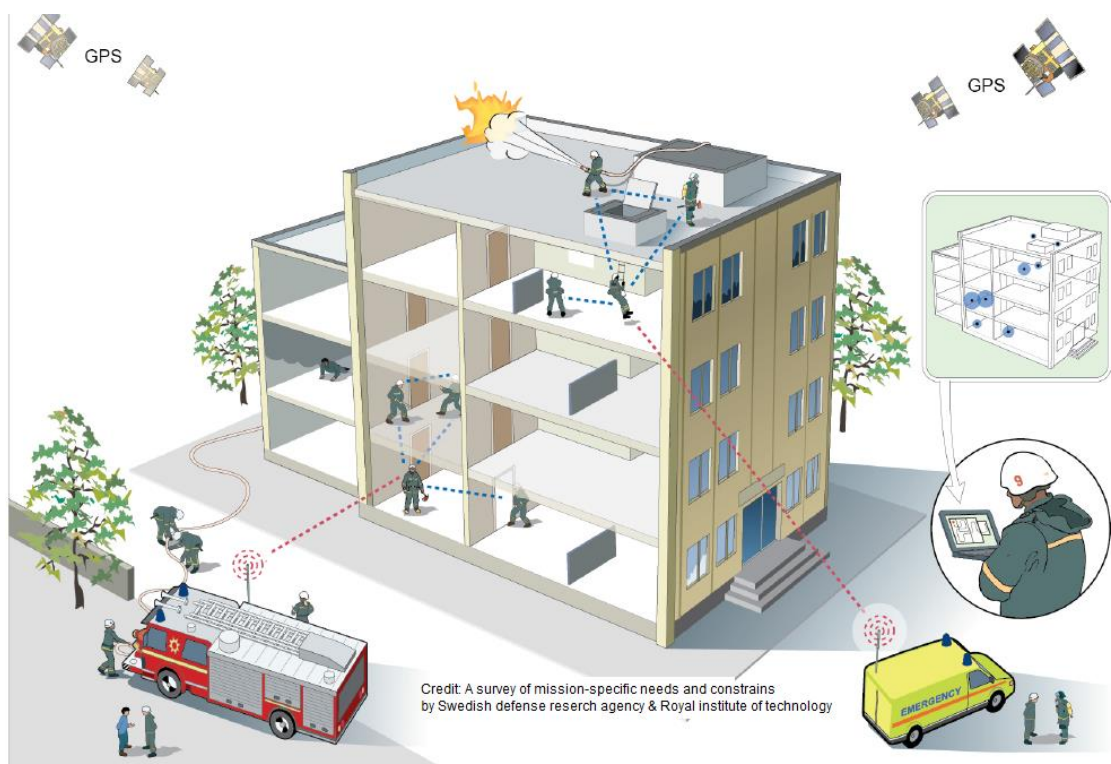
Elbit C4I and Cyber is already a key player in the Hybrid Navigation Sector. Elbit SmartTrack™ system has been successfully demonstrated in numerous of urban and GPS denied environments navigation contests in Israel and US. This innovative system is still facing some gaps to comply with mission-critical first responders requirements set.

Main Use-Cases

The PST System is designated to support the following main use-cases:

1. Firefighters operating in high-rise buildings – monitoring firefighters 3D location within a GPS denied environment as elevator piers, staircases and basements.
2. SWAT teams operations in tunnels, underground parking lots, etc.
3. Jail officers and staff, operating in sealed corridors and halls.

The commander will have its team locations projected on a digital map at the PST C4I terminal.



Current innovation gaps

The main gaps are: **Robustness, Accuracy and Data Integrity**

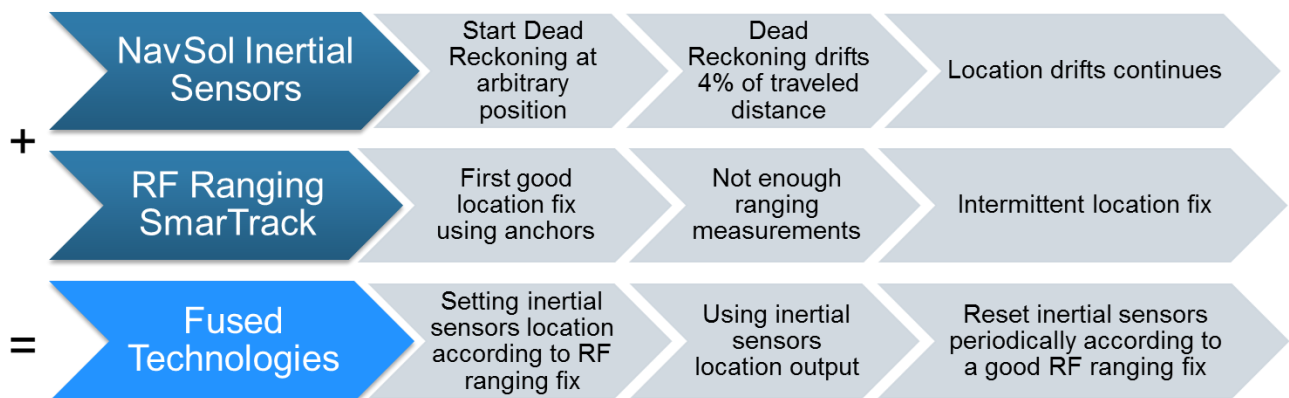
Robustness – under different field conditions at urban environment, Elbit SmarTrack RF signal, used for ranging, may be blocked for number of cycles. Its anchors current position may not be optimal for generating good location reference, etc. This robustness should come from a complementary system, to deliver together a reliable results during mission critical operation.

Accuracy – Elbit SmarTrack accuracy mean value shall be bounded at 1m in 3 dimensions (X,Y,Z) in order to differentiate first responders location between floors, rooms and corridors inside a building.

Data Integrity – Users location data shall be presented on the commander's terminal with high level of integrity, to allow effective mission control and coordination.

The combination of Elbit SmarTrack with top notch NavSol RT-Foot-Tracking inertial based solution will address all gaps above.

The Precise Smart Track Integrated System will allow real fielded operational solution for first responders.



Elbit SmarTrack system is all-in-one personnel- tracking device for complex environment with limited/jammed GPS reception. The SmarTrack features RF transceiver for RF ranging capabilities, an onboard GPS/Glonass receiver, and local data connectivity. The SmarTrack can be deployed in any geographical operational indoor and outdoor environment, and serves as a Data Link to transmit comprehensive C2 data between users. The current SmarTrack system can calculate and monitors the location of 4 to 100 network users simultaneously, non-line-of-Sight (NLOS), with a location accuracy better than three (3) meters in urban and indoor environments.

The NavSol RT-Foot-Tracking modules use inertial sensing technology, are self-contained, and are capable of calculate a person location with a 4% drift of the total traveled distance, regardless of the environmental conditions. In addition, the shoe mounted sensors may also provide an important information about the user vital signs.

U.S and Israeli technology fusion - By combining the NavSol Real Time Foot Tracking technology with Elbit SmarTrack RF ranging technology, we can finally extend the system accuracy, robustness and integrity for a long-term precise group tracking capabilities.

This fusion between the RF based Virtual Anchor Positioning and Monitoring System (Elbit) and the RT-Foot-Tracking inertial-based Localization System (NavSol) is being proposed to BIRD as a promising concept framework, which aims to significantly improve the positioning estimation accuracy, with virtually unlimited tracking capabilities and with no need for in-building infrastructure.

The combined solution offers a short term continuous (relative) location sensing together with a long term (absolute) intermittent locations updates. The positioning process, evaluated by boot mounted sensors, has high accuracy but drifts with time, while the SmarTrack system has a long term accuracy but may not be available all the time.

Fused technologies accuracy Improvements

SmarTrack network nodes (users) may be used to create a well-defined grid. However, it has a drawback of ambiguity in which the grid is not uniquely positioned in the space and its orientation is unknown. The usage of the shoe-mounted sensors provides additional positioning information to overcome such ambiguity.

For example: a network user movement in a specific direction (evaluated from the shoe mounted device) defines the orientation of the grid.

The usage of the RF based location sensing (SmarTrack) may improve the shoe-mounted sensor's bias estimations. Data fusion between shoe mounted sensor solution and a pressure measurement sensor (barometer) may provide a better elevation estimation accuracy and compensate for both system drifts.

We predict that the fused solution will be accurate enough to determine the room and floor location the first responder is at, during mission. The Precise SmarTrack (PST) users location will be calculated and displayed at the commanders terminal. The basic system shall support a group of up to 100 users.

Accuracy and Robustness Improvement

The system Error over computation cycle (3 sec) is presented as:

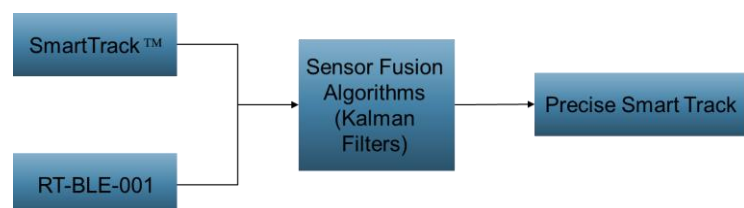
$$\delta_{System} = \delta_{RF} * Q_{fRF} + \delta_{PDR} * Q_{fPDR}$$

- **The System is initiated with δ_{RF} that is less than 0.5 m**
- **Typical PDR Error within over computation cycle (4 m) is 0.16 m**

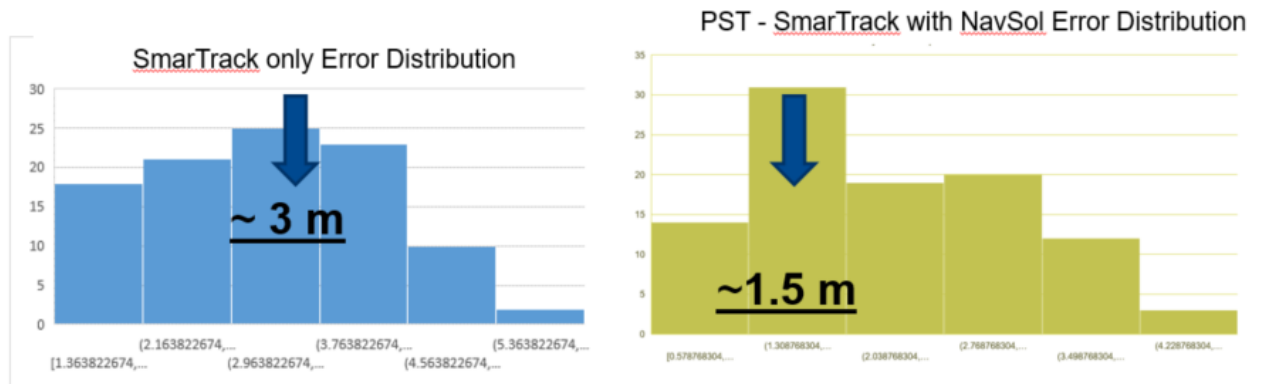
Quality factor Q_{fRF} representing RF integrity:

- Measuring the Signal To Noise Ratio
- Estimation of multipath levels
- Anchors geometry
- Multilateration convergence indicators

Quality factor Q_{fPDR} representing the Dead reckoning error over time



We have made several simulations to estimate the total locations deviation, by fusing these 2 technologies. The simulation results below show the error distribution with and without fusing the Inertial based sensor:



Although the filter parameters are still not optimized and part of weight algorithm is not yet implemented, the Error Mean Value is significantly improved from 3m to 1.5m. Further algorithmic optimization is likely to improve the mean error even more (expected to be about 1 m.)

Fused technology strategies

With the current SmarTrack system, in some configurations the anchors receive “external” position information

- This “external” information availability might be intermittent
- The use of inertial based system at the anchors may bridge that times of “external” position unavailability

Determine position by combining the result and weighting them by grade

Differential inertial results

- Exploit the fact that for short distances the inertial system is very accurate
- The variance of the RF based system is not changing over distance or time – but “great” results are identifiable
- The RF based system can provide fixes when “great” results are available and the inertial systems will bridge the periods between “great” results

Features	NavSol	SmartTrack™	PTS
Accuracy	4% from D	~ 3m	Less than 1 m
Availability	Permanent	Partial	Permanent
Drift	Yes	No	No
Connectivity	No	Yes	Yes
Navigation	No	Yes	Yes
In-door tracking	Yes	Low accuracy	Yes
Floor Location	Partial (while no drift)	No	Yes
In-door navigation	No	No	Yes
C4I	No	Yes	Yes
Health Monitoring	Yes	No	Yes

Operation team locations are presented at SmarTrack C4I Demo Application:



System Anchors

As described, the system needs 3 anchors for position reference. These Anchors can support different deployment configurations:

- Fixed anchor** - is a PST device (node), installed on a fixed infrastructure item, with a known or a predefined global location (GPS / other). This anchor can be located inside or outside the building.
It will have a radio connectivity to other nodes in the network.
- Mobile anchor** – is a PST device (node), carried by a user or a vehicle. This node should have a clear reception of a GPS signal. It can be a squad command post, a SWAT Sniper, a fire track, etc.
Each anchor will help to translate node's relative location to a global location.



E. Proposed R&D Program

E.1 Analysis of the Problem

The proposed R&D program assets and background knowledge are:

- 1) NavSol miniature RT-Foot-Tracking inertial localization module.
- 2) NavSol IP protected tracking algorithm.
- 3) Elbit SmarTrack Patented System for 3D group localization
- 4) Elbit's extensive experience in system integration and deployment for the defense and public safety market.

The proposed R&D program challenges are:

- 1) SmarTrack stand-alone implementation with improved accuracy.
- 2) NavSol stand-alone implementation of the RT-Foot-Tracking with improved accuracy.
- 3) NavSol correction algorithms for errors caused by inertial sensor drift
- 4) SmarTrack Unique IP to overcome Multipath in an Urban/Indoor environments
- 5) *SmarTrack* System unique algorithm to overcome the lack of synchronization between the units in order to calculate the accurate ranges and positions

To reduce risks, addressing the technology availability, and to accelerate the time to market, the R&D program was split into two phases:

- ✓ Phase 1 – Standalone Systems development – HW and SW with improved accuracy.
- ✓ Phase 2 – Precise Smart Track System Integration and Testing.

E.2 Proposed Approach

A general plan of the proposed efforts, detailed in tasks description

1	Task #:	1					
2	Task name:	Project Kick-off					
3	Company taking part in task (mark with “x”)	IL:	X	US:		Both:	
4	Task duration (days):	2					
5	Start date (DD/MM/YY):	01/10/20		End date (DD/MM/YY):		03/10/20	
6	Company name:	[Elbit]			[NavSol]		Total
7	Task budget (K\$):	23.877			0		23.877
8	Task budget (% of total):	100%			0%		100%
9	Objective of task:	Project Initiation sync, base line and alignment.					

10	Task Description (no restriction on size)		
The kick-off is planned to run in Michigan with Elbit C4I, NavSol and Elbit USA participation. During this task System Requirements Review will be done.			
11	# of the Milestone(s) to be reached:	1	
12	# of the Deliverable(s) to be provided:		

1	Task #:	2					
2	Task name:	Design next generation of RT-Foot-Tracking device					
3	Company taking part in task (mark with "x")	IL:		US:	X	Both:	
4	Task duration (days):	137					
5	Start date (DD/MM/YY):	01/10/20		End date (DD/MM/YY):	18/02/21		
6	Company name:	[Elbit]		[NavSol]		Total	
7	Task budget (K\$):	0		157.431		157.431	
8	Task budget (% of total):	0%		100%		100%	
9	Objective of task:	Design next generation of RT-Foot-Tracking device					
10	Task Description (no restriction on size)						
New device to include among other enhancements a superior sensing capabilities, a more powerful microcomputer, and Bluetooth wireless communication capabilities							
11	# of the Milestone(s) to be reached:	2					
12	# of the Deliverable(s) to be provided:						

1	Task #:	3		
2	Task name:	Port real-time localization algorithms		
3	Company taking part in task (mark with "x")	IL:	US:	Both:
4	Task duration (days):	53		
5	Start date (DD/MM/YY):	04/02/21	End date (DD/MM/YY):	27/03/21
6	Company name:	[Elbit]	[NavSol]	Total
7	Task budget (K\$):	0	48.281	48.281
8	Task budget (% of total):	0%	100%	100%
9	Objective of task:	Port real-time algorithms into the device version micro-controller		
10	Task Description (no restriction on size)			
Migrate tracking algorithms to run directly in the onboard microcomputer eliminating the need for having an additional portable computer (e.g. Android device)				
11	# of the Milestone(s) to be reached:			
12	# of the Deliverable(s) to be provided:	2		

1	Task #:	4		
2	Task name:	Bluetooth hardware and software interface to Elbit development		
3	Company taking part in task (mark with "x")	IL:	US:	Both:
4	Task duration (days):	48		
5	Start date (DD/MM/YY):	28/03/21	End date (DD/MM/YY):	16/05/21
6	Company name:	[Elbit]	[NavSol]	Total
7	Task budget (K\$):		74.847	74.847
8	Task budget (% of total):	0%	100%	100%

9	Objective of task:	Bluetooth hardware and software interface to Elbit development		
10	Task Description (no restriction on size)			
Define and implement wireless communication with Elbit SmarTrack™ system				
11	# of the Milestone(s) to be reached:			
12	# of the Deliverable(s) to be provided:			

1	Task #:	5						
2	Task name:	System Hardware and Mechanics development and improvements						
3	Company taking part in task (mark with “x”)	IL:	X	US:		Both:		
4	Task duration (days):	137						
5	Start date (DD/MM/YY):	01/10/20		End date (DD/MM/YY):		18/02/21		
6	Company name:	[Elbit]			[NavSol]		Total	
7	Task budget (K\$):	252.539					252.539	
8	Task budget (% of total):	100%			0%		100%	
9	Objective of task:	System Hardware and Mechanics development and improvements						
10	Task Description (no restriction on size)							
Update the current prototype hardware and mechanics to achieve superior results and decrease power consumption – according to First responders Mission Profile.								
11	# of the Milestone(s) to be reached:			1				
12	# of the Deliverable(s) to be provided:			1				

1	Task #:	6						
2	Task name:	System Software development and improvements						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	122						
5	Start date (DD/MM/YY):	29/10/20						
	End date (DD/MM/YY):	01/03/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	175.479						
8	Task budget (% of total):	100%						
9	Objective of task:	System Software development and improvements						
10	Task Description (no restriction on size)							
	Software changes and improvements to achieve superior accuracy and robustness. Implementing features for advance filtering based on internal sensors and anchors error estimator and integrity check.							
11	# of the Milestone(s) to be reached:	2						
12	# of the Deliverable(s) to be provided:	3						

1	Task #:	7						
2	Task name:	Presice Smart Track (PST) System User Application Development						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	123						
5	Start date (DD/MM/YY):	22/10/20						
	End date (DD/MM/YY):	25/02/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	137.111						
8	Task budget (% of total):	100%						
		%						
		100%						

9	Objective of task:	Precise Smart Track (PST) System User Application Development		
10	Task Description (no restriction on size)			
User application development to enable a user (Commander) to control what he sees and to configure the system.				
11	# of the Milestone(s) to be reached:	2		
12	# of the Deliverable(s) to be provided:			

1	Task #:	8					
2	Task name:	Bluetooth hardware and software Interface to NavSol development					
3	Company taking part in task (mark with "x")	IL:	X	US:		Both:	
4	Task duration (days):	47					
5	Start date (DD/MM/YY):	04/03/21		End date (DD/MM/YY):	21/04/21		
6	Company name:	[Elbit]		[NavSol]		Total	
7	Task budget (K\$):	84.503				84.503	
8	Task budget (% of total):	100%		0%		100%	
9	Objective of task:	Bluetooth hardware and software Interface to NavSol development					
10	Task Description (no restriction on size)						
Hardware and Software design to enable wireless communication with NavSol module.							
11	# of the Milestone(s) to be reached:						
12	# of the Deliverable(s) to be provided:						

1	Task #:	9						
2	Task name:	Assist with the integration of RT-Foot-Tracking system						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td></td> <td>US:</td> <td>X</td> <td>Both:</td> <td></td> </tr> </table>	IL:		US:	X	Both:	
IL:		US:	X	Both:				
4	Task duration (days):	42						
5	Start date (DD/MM/YY):	03/06/21						
	End date (DD/MM/YY):	15/07/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	76.417						
8	Task budget (% of total):	100%						
9	Objective of task:	Support the integration of RT-Foot-Tracking system						
10	Task Description (no restriction on size)							
Provide assistance to Elbit with the integration efforts of the NavSol RT-Foot-Tracking system with the Elbit SmartTrack.								
11	# of the Milestone(s) to be reached:							
12	# of the Deliverable(s) to be provided:							

1	Task #:	10						
2	Task name:	Integrate other available sensing modalities						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td></td> <td>US:</td> <td>X</td> <td>Both:</td> <td></td> </tr> </table>	IL:		US:	X	Both:	
IL:		US:	X	Both:				
4	Task duration (days):	121						
5	Start date (DD/MM/YY):	16/07/21						
	End date (DD/MM/YY):	17/11/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	112.383						
8	Task budget (% of total):	100%						
9	Objective of task:	Improve NavSol Module Performance.						

10	Task Description (no restriction on size)			
Implement automatic calibrations based on environmental conditions, based on additional sensor information such as magnetometers and barometers.				
11	# of the Milestone(s) to be reached:			
12	# of the Deliverable(s) to be provided:			

1	Task #:	11					
2	Task name:	Improve RT-Foot-Tracking system using data from field tests					
3	Company taking part in task (mark with “x”)	IL:		US:	X	Both:	
4	Task duration (days):	135					
5	Start date (DD/MM/YY):	18/11/21		End date (DD/MM/YY):		03/04/22	
6	Company name:	[Elbit]		[NavSol]		Total	
7	Task budget (K\$):			130.637		130.637	
8	Task budget (% of total):	0%		100%		100%	
9	Objective of task:	Improve RT-Foot-Tracking system using data from field tests					
10	Task Description (no restriction on size)						
Improve performance by increasing the number of states in Kalman filters to accommodate higher order statistical errors using data from field tests. Sensor fusion algorithms will be tuned to provide the best performance using results and feedback from field tests.							
11	# of the Milestone(s) to be reached:						
12	# of the Deliverable(s) to be provided:						

1	Task #:	12						
2	Task name:	Integration with NavSol Module						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	41						
5	Start date (DD/MM/YY):	03/06/21						
	End date (DD/MM/YY):	14/07/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	94.356						
8	Task budget (% of total):	100%						
9	Objective of task:	Integration with NavSol Module						
10	Task Description (no restriction on size)							
	Integration with NavSol RT-Foot-Tracking module using Bluetooth communication.							
11	# of the Milestone(s) to be reached:							
12	# of the Deliverable(s) to be provided:	4						

1	Task #:	13						
2	Task name:	System POD						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	61						
5	Start date (DD/MM/YY):	16/07/21						
	End date (DD/MM/YY):	17/09/21						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	164.511						
8	Task budget (% of total):	100%						
9	Objective of task:	System Functionality - Prove of Design testing						

10	Task Description (no restriction on size)			
Perform system POD tests to get integrated system functioning properly – HW, SW, Communication, End Unit + Control Unit.				
11	# of the Milestone(s) to be reached:	3		
12	# of the Deliverable(s) to be provided:			

1	Task #:	14					
2	Task name:	New algorithm for fusion between RF ranges calculations and boot inertial position					
3	Company taking part in task (mark with “x”)	IL:	X	US:		Both:	
4	Task duration (days):	81					
5	Start date (DD/MM/YY):	09/17/21		End date (DD/MM/YY):		08/12/21	
6	Company name:	[Elbit]		[NavSol]		Total	
7	Task budget (K\$):	161.653				161.653	
8	Task budget (% of total):	100%		0%		100%	
9	Objective of task:	New algorithm for fusion between RF ranges calculations and boot inertial position					
10	Task Description (no restriction on size)						
This is needed to achieve improved accuracy and to maintain anchors for short time by the inertial sensors in hybrid mode with SmarTrack . Field tests to obtain the best weighting value we give for each technology in the multilateration position calculations in order to achieve the best performance.							
11	# of the Milestone(s) to be reached:						
12	# of the Deliverable(s) to be provided:						

1	Task #:	15						
2	Task name:	Application improvements						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	54						
5	Start date (DD/MM/YY):	10/12/21						
	End date (DD/MM/YY):	04/02/22						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	116.506						
8	Task budget (% of total):	100%						
9	Objective of task:	Control unit Application improvements						
10	Task Description (no restriction on size)							
UI-UX updates based on first portion of field tests								
11	# of the Milestone(s) to be reached:							
12	# of the Deliverable(s) to be provided:							

1	Task #:	16						
2	Task name:	Field tests and Demonstration						
3	Company taking part in task (mark with "x")	<table border="1"> <tr> <td>IL:</td> <td>X</td> <td>US:</td> <td></td> <td>Both:</td> <td></td> </tr> </table>	IL:	X	US:		Both:	
IL:	X	US:		Both:				
4	Task duration (days):	60						
5	Start date (DD/MM/YY):	04/02/22						
	End date (DD/MM/YY):	04/04/22						
6	Company name:	<table border="1"> <tr> <td>[Elbit]</td> <td>[NavSol]</td> <td>Total</td> </tr> </table>	[Elbit]	[NavSol]	Total			
[Elbit]	[NavSol]	Total						
7	Task budget (K\$):	190.222						
8	Task budget (% of total):	100%						
9	Objective of task:	System Performance Testing and marketing.						

10	Task Description (no restriction on size)			
Demonstration-Field testing for different scenarios on different urban situation, anchor deployment testing etc. Demonstration to at least one potential customers				
11	# of the Milestone(s) to be reached:	4		
12	# of the Deliverable(s) to be provided:	5		

Milestones and Deliverables:

#	<u>Milestone</u> Definition / Description and How Will It be Measured	Milestone Date (MM/YY)
1	Kick-off+ SRR- System Requirements Review	10/20
2	SDR - System Design Review	02/21
3	POD Results Review	09/21
4	TRR – Test Readiness Review	01/22
5		
#	<u>Deliverable</u> Definition & Description	Deliverable Date (MM/YY)
1	System Design Documentation	10/20
2	Controller based (No Android) NavSol Module Accuracy Benchmark	03/21
3	Elbit Improved RF Module Accuracy Benchmark	03/21
4	PST Integration - RF + NavSol Communication Benchmark	07/21
5	PST Demonstration	[end of project]

E.3 Analysis of the Project's TRL

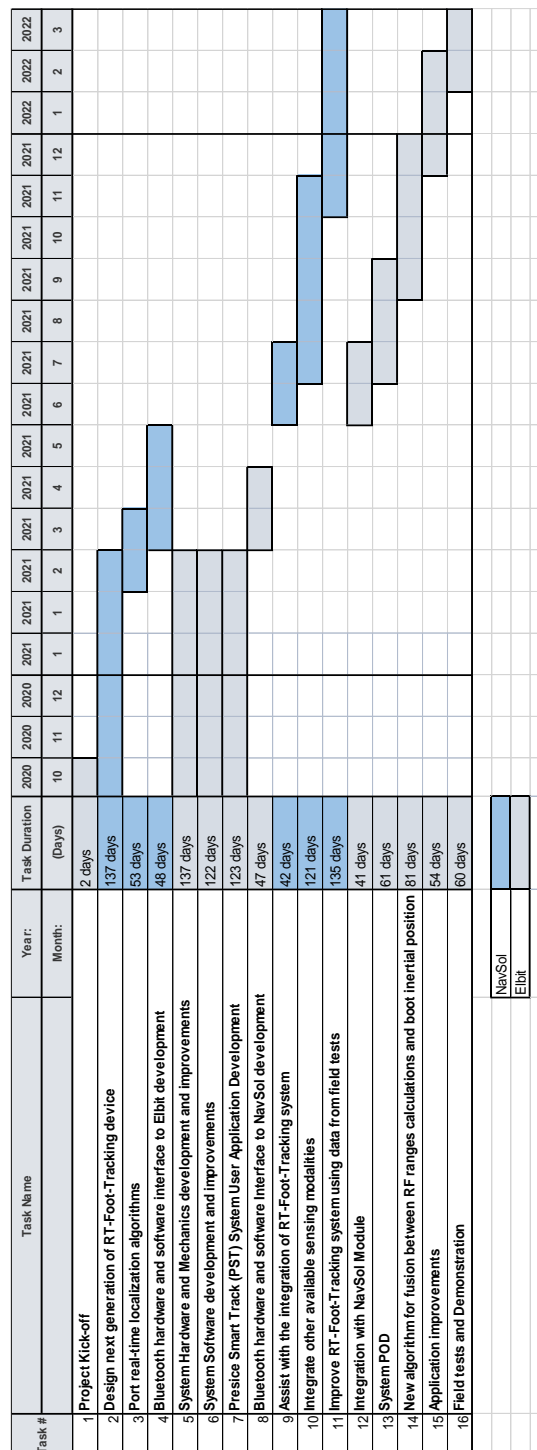
Identify Project's TRL prior to the Project Inception	Examples substantiating the project's TRL prior to Project Inception
Technology Demonstration for both components was successfully completed. – TRL6	The NavSol RT-Foot-Tracking demo module was successfully demonstrated in October 2018, during the Urban Navigation competition organized by the USA DoD and the Israeli MoD at the military training installations in Tzeelim, Israel – 4 th place
	The Elbit SmarTrack demo system was successfully demonstrated in October 2018 as well, during the Urban Navigation competition organized by the USA DoD and the Israeli MoD at the military training installations in Tzeelim, Israel - 1 th place.

Expected Project's TRL by the Project Completion	Examples substantiating the project's expected TRL by the Project's Completion (based on the Goals and Deliverables provided in section E.2)
System Commissioning - TRL7	During 18 month BIRD program of integrated system will be completed. Full-scale System Testing is planned to be performed in different operational scenarios and environments. Based on test results there are tasks of system refinement.

F. Program Plan

This 18 months program will be a joint effort for both partners – Elbit Systems C4I and Cyber together with Navigation Solutions LLC.

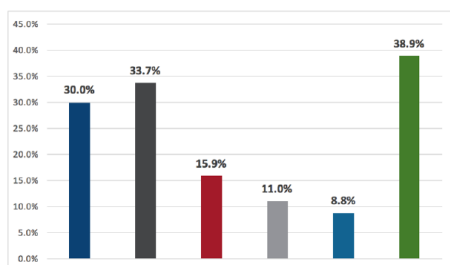
The following chart represents the program's tasks allocation over this period (assuming contract award – October 1st 2020, any delay will shift the program schedule accordingly):



G. The Market

The U.S public safety market is estimated at 2.5 million first responders and additional 22.5 million employees as 2nd tier public safety support. There are about 65000 Fire Posts and more than 17000 Law enforcement agencies with about 700 SWAT teams. The target market for this service (by using the PST solution) is the federal agencies as well as the state and local agencies.

The ability to identify the location of first responders and their proximity to risks and hazards in real time requires the development of a responder geolocation system that works in all environments, and software or devices enabled to display the precise location of such responders (i.e., x, y, and z coordinates) on an intuitive user interface. Further, the establishment of operational standards or requirements is likely to aid to the development of

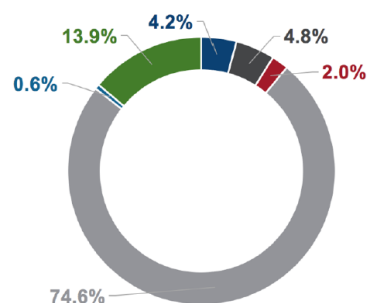


Geolocation Market (CAGR), 2018 to 2022

■ Indoor (Above and Below Ground) Responder Geolocation
■ Infrastructure Standards for Technology Integration
■ Rapid Building Characterization, Generation and Display
■ Outdoor Responder Geolocation
■ Maritime (Above and Below Water) Geolocation
■ Hybrid (Indoor and Outdoor) Responder Geolocation

responder safety, efficiency and effectiveness. A myriad of geolocation solutions currently exist in the market, many of which have first responder applications. Outdoor responder geolocation systems appear to be the most mature market due to the availability of GPS.

In recent years, the emergence of hybrid (indoor and outdoor) responder geolocation solutions, such as Location-Based Services, may provide the best means of addressing the

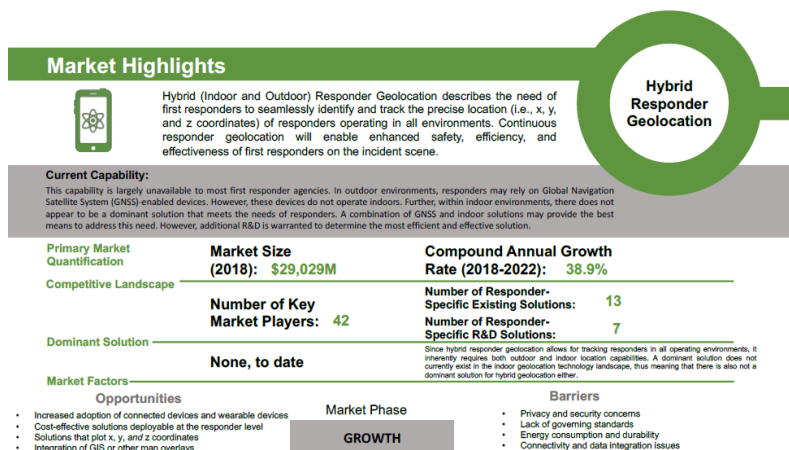


Geolocation Market, 2018

■ Indoor (Above and Below Ground) Responder Geolocation
■ Infrastructure Standards for Technology Integration
■ Rapid Building Characterization, Generation and Display
■ Outdoor Responder Geolocation
■ Maritime (Above and Below Water) Geolocation
■ Hybrid (Indoor and Outdoor) Responder Geolocation

geolocation needs with a seamless solution for the first responder community.

As of 2018, the Outdoor Responder Geolocation Market captures the greatest market share at 74.6 percent, followed by Hybrid (Indoor and Outdoor) Responder Geolocation at 13.9 percent. Infrastructure Standards for Technology Integration, which will support the development of indoor responder geolocation solutions is expected to grow at the second highest CAGR of 33.7 percent during the forecast period of 2018 to 2022. Hybrid (Indoor and Outdoor) Responder Geolocation is growing at the highest CAGR of 38.9 percent during the forecast period, which may be attributed to the increasing use of mobile smartphones and other connected devices



The first years for marketing this service will be focused on mid-tier agencies with ~500 first responders each mostly Fire Departments and Police SWAT.

Calendar year:	2021	2022	2023
Target market size for developed product (M\$):	50	100	150
Estimated market share (%):	4	8	12
Estimated sales quantity (units):	5000	10000	15000
Estimated representative unit price (\$):	400	400	400
Estimated sales revenue (K\$):	2000	4000	6000
Estimated cumulative sales revenue (K\$):	2000	6000	12000

H. Commercialization - Plans and Prospects

H.1 Product Manufacturing, Marketing and Sales Activities

PST System consists of Hardware Units and Software application. The End Unit price will be about \$400, C4I Unit price will be \$10K

The PST Kit will be fitted to customer needs in two configurations:

- Fire Fighter/ EMC Crew/ Police - 15 PST End Units + 1 PST C4I Units - \$16K
- SWAT - 30 PST End Units + 2 PST C4I Units – \$32K

Both configurations will support relevant First responders Operation Mode.

Elbit Systems will be responsible for the marketing and sales for this innovative solution, as part of the PST total offering to the federal entities and Homeland Security agencies. NavSol LCC will provide Elbit Systems the necessary technical support and upgrades.

PST marketing and sales to the US public safety market is carried out by Elbit Systems of America (ESA), a subsidiary of Elbit Systems. These marketing efforts will be focused on the prime US HLS agencies.

H.2 Cash Flow Analysis

Program cash flow analysis spreadsheet file is attached to this proposal.

I. Cooperation, Economic and Social Benefits

Incident commanders and team leaders expressed a need for a tool that displays the location of responders and their proximity to potential threats. The ability to geolocate responders in all environments, coupled with simultaneous awareness of incident risks and hazards, could potentially improve safety, efficiency and effectiveness. The PST System will deliver the solution for the gap.

The collaboration between Elbit Systems C4I and Cyber and NavSol LLC in research and development will be very synergistic as follows:

Elbit will lead and coordinate this research and development program.

Given the commercial terms to be set between the parties, Elbit will exclusively be able to use NavSol dead reckoning technology, together with this program outcomes, for public safety market use.

Elbit will be able to offer this technology as part of Precise Smart Track offering for first responders.

The partners believe this US-Israeli collaboration will lead to future long term cooperation.

The BIRD proposed program is aimed at supporting the funding of the R&D phase of this important capability for first responders, to the point of introducing demo systems for public safety agencies.

The development phase expenses are established to be 70% by Elbit and 30% by NavSol.

Revenues and Profit sharing between Elbit and NavSol during product commercialization will be determined during the program in accordance with the assets and capabilities of each company.

J. Organization and Management Plan

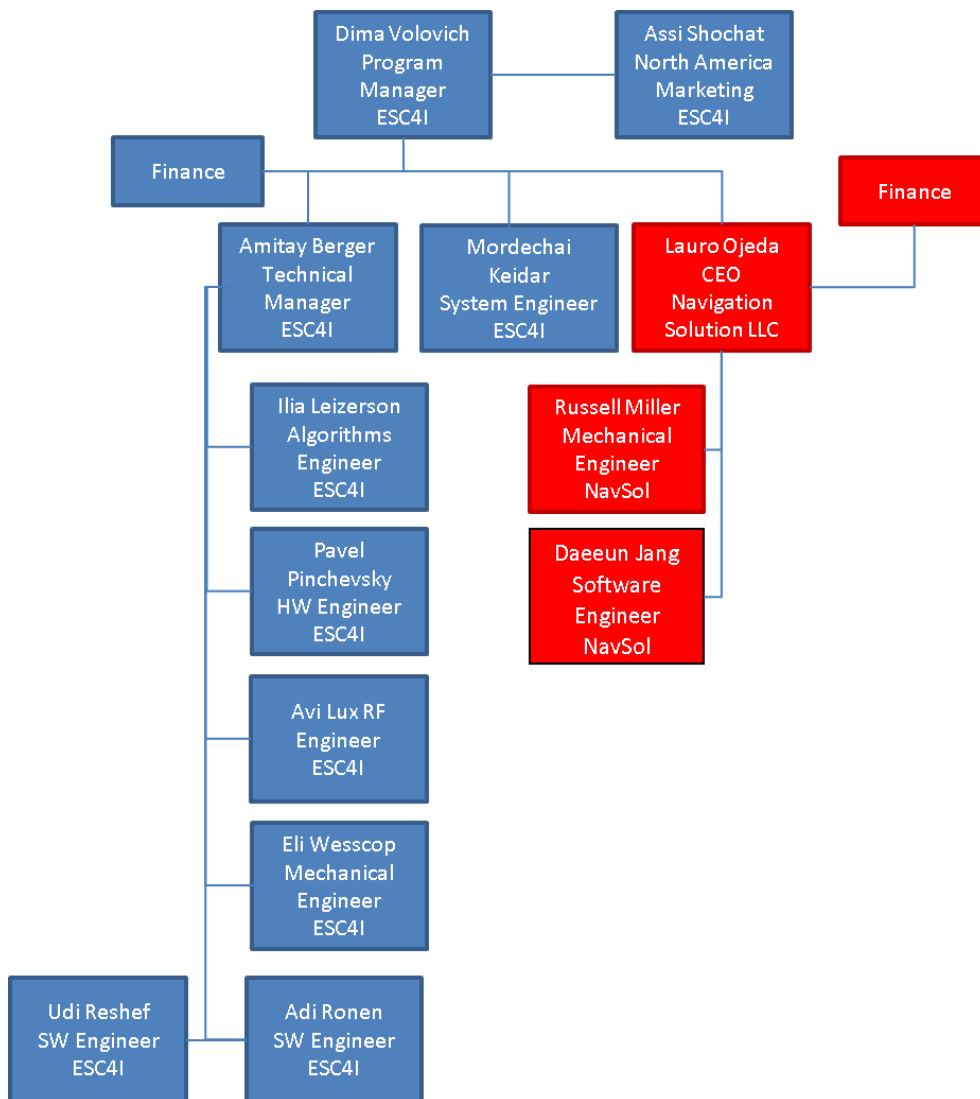
This BIRD program will be handled by both companies' qualified and experienced personnel and will be monitored by their management officials.

The program will be managed and controlled by an Elbit program manager.

The program kick-off meeting will be held in Michigan (final venue to be determined). The program scope and requirements will be presented to the technical teams from both companies, to align with BIRD guidelines.

A design review meeting will also be held in Michigan, four months after program kick-off, with the technical teams from both companies, to summarize the design phase outcomes and to continue with implementation. Design documents will be shared between the partners.

A weekly conference call / WebEx between technical teams will be held, with technical teams from both companies, to align with the program schedule and to discuss current issues / outcomes.



J.1 Resumes of Key Personnel

Elbit Systems Land and C4I

Dima Volovich – Program Manager

Education: BSc in Physics Technion, Haifa.

Experience: R&D Program Manager – Elbit, R&D Program Manager - RAFAEL, Program Officer - IDF

Dima holds position of R&D Programs Manager in CTO of Elbit C4I and Cyber with 15 years of progressive leadership experience in Defence and HLS Industry.

Dima has an experience in working with government, military and homeland security agencies (marketing, sales, service and training activities) on a various of multidisciplinary system R&D programs.

Dima also has extensive experience in managing system, software, hardware and QA groups for the last 15 years.

Amitay Berger – Technical Manager

Education:

Polytechnic University New-York (Israel Campus), MSM – Master of Science in Management

Bar-Ilan University – B.sc in Electrical Engineering, Expertise in: Communication, Electro-Optics and Microelectronics

Experience: Since 2013 Technical Manager in Elbit. Amitay is leading development of SmarTrack In-door Navigation System. A hands-on board design engineer with 10 years' experience from top notch technological companies – Israel aerospace Industries (IAI) and Astronautics.

Experience working across multiple sectors, for domestic and international customers and suppliers using a wide variety of technologies and techniques.

Mordechai Keidar - System Engineer

Education: BSc Computer Science

Experience: Since 2001; Solution Architect/Senior Systems Engineer, Acceptance Manager, Requirements, Integration & Test Manager, IVV Manager, Requirements Manager, Software Engineer / Team Leader / System Test

A hands on Solution Architect, Technical Manager and Senior Systems Engineer with 10 years' experience working on large, complex real-time military and commercial systems at both management and technical level; familiar with all aspects of systems engineering with extensive experience of the full system lifecycle.

Adi Ronen - SW Engineer

Education: BSc Computer Science

Experience: Since 2000, Technical Assurance Manager, Lead Developer, Lead Designer, Software Developer

Over 10 years of experience that covers team leader, lead designer to developer. Has also been involved as subject matter expert on a number of embedded projects.

During his career, Adi has developed software for a variety of software applications using techniques relevant to both hard and soft real-time environments hosted on a range of different hardware platforms. Adi has also been involved in design and/or development of application software in the less time critical environments to which embedded systems are interfaced.

Adi is also fully conversant with the development of desktop applications and has a wide understanding of the Microsoft Windows architecture from standalone executable through embedded component level down to driver development and interfacing.

Adi is multi-skilled, having a wealth of experience whilst working within the various sectors i.e. retail, transport, public service, government and defence.

Dr. Ilya Leizeron - Algorithms Engineer

Education: Ph.D degree in physics (Technion)

Experience: Dr. Leizeron works in Elbit Systems since 2004.

Dr. Leizeron is honored by prestigious international awards in Electro-Optics and Entrepreneurship. He is an author of tens of scientific publications and patents. His inventions and ideas are implemented in various areas of semiconductor industry, military industry, NDT, sensing and physiology and were cited by Frost&Sullivan. Dr. Leizeron is developing Navigation Algorithms for Elbit SmartTrack System.

Navigation Solutions LLC

Lauro V. Ojeda

Education:

- M.S. Electrical Engineering, Army Polytechnic School, Sangolqui-Ecuador, 1997

Work Experience:

- Manager/Founder, Navigation Solutions LLC, Ann Arbor, MI, 2006 - Present
- Associate Research Scientist, The University of Michigan, Ann Arbor, MI, 2018 - Present
- Assistant Research Scientist, The University of Michigan, Ann Arbor, MI, 2010 – 2018
- Research Investigator, The University of Michigan, Ann Arbor, MI, 2001-2010
- Visiting Research Investigator, The University of Michigan, Ann Arbor, MI, 1998 – 2001

Products Most Closely Related To The Proposed Project

- Ojeda L, Borenstein J. Non-GPS Navigation for Security Personnel and Emergency Responders. Journal of Navigation. 2007 September; 60(3):391-407.
- Ojeda L, Borenstein J, inventors. The University of Michigan, assignee. Heading Error Removal System for Tracking Devices. US 20110087450. 2011 April 14.
- Borenstein J, Ojeda L. Heuristic Reduction of Gyro Drift in Vehicle Tracking Applications. International Journal of Vehicle Information and Communication Systems. 2009 August 01; 2(1-2).
- Ojeda L. Transfer Alignment from a Personal Dead Reckoning System to a Handheld IMU. Proceedings of the SPIE Defense, Security + Sensing. 2011 April 25.
- Kwanmuang S, Borenstein J, Ojeda L. Magnetometer-enhanced Personal Locator for Tunnels and GPS-denied Outdoor Environments. Proceedings of the SPIE Defense, Security + Sensing.

Russell J. Miller

Education:

- B.S. Mechanical Engineering, California Polytechnic State University, San Luis Obispo, CA, 1988

Work Experience:

- Manager/Founder, Navigation Solutions LLC, Ann Arbor, MI, 2006 - Present
- Associate Research Scientist, The University of Michigan, Ann Arbor, MI, 2018 - Present
- Assistant Research Scientist, The University of Michigan, Ann Arbor, MI, 2010 – 2018
- Research Investigator, The University of Michigan, Ann Arbor, MI, 2001-2010
- Visiting Research Investigator, The University of Michigan, Ann Arbor, MI, 1998 – 2001

Daeun Jang

Education:

- M.S. in Electrical Engineering, University of Michigan, Ann Arbor, MI, 2014
- B.S. in Electronic Engineering, Kyung Hee University, Korea, 2010

Work Experience:

- Electrical Engineer, Made In Space, Mountain View, CA, 2017 – Present
- Robotics Consultant, La Habra Heights, C, 2016 –2017
- Research (Robotics/ Electrical) Engineer, University of Michigan, Ann Arbor, MI, 2013 –2016

K. The Companies and their resources

Elbit Systems Land and C4I Ltd. (ESLC) was founded in 2007 and is a private wholly owned subsidiary of Elbit Systems Ltd (ESL) (a public company traded dually in NASDAQ and TASE) and serves as its Land and C4ISR Division. ESLC has ~2200 employees and its main premises are located in Netanya, Israel. As a wholly owned subsidiary of Elbit Systems Ltd., ESLC's financial results are published annually, as part of Elbit Systems' consolidated financial results. Please see attached the latest audited financial report for the year 2015. For further information please see financial results of the past years in the following link:

<http://ir.elbitsystems.com/phoenix.zhtml?c=61849&p=irol-reportsannual>

ESLC is one of the world's leading companies in the field of developing and implementing advanced C4ISR systems, integrated intelligence and communication systems. ESLC's proven solutions are fully operational and used by governmental agencies and armed forces around the world.

ESL is an international high technology company engaged in a wide range of defense, homeland security and commercial programs throughout the world. The Company, which includes Elbit Systems and its subsidiaries, operates in the areas of aerospace, land and naval systems, command, control, communications, computers, intelligence surveillance and reconnaissance ("C4ISR"), unmanned aircraft systems, advanced electro-optics, electro-optic space systems, EW suites, signal intelligence systems, data links and communications systems, radios and cyber-based systems.

Elbit Systems Ltd. also focuses on the upgrading of existing platforms, developing new technologies for defense, homeland security and commercial applications and providing a range of support services, including training and simulation systems.

Navigation Solutions LLC (NavSol) is a privately held company incorporated in the State of Michigan in 2006. NavSol's founder has over 20 years of experience developing real-time motion tracking devices using inertial sensors. NavSol's technical team are recognized leaders in the field of inertial sensing for biomechanics and have been the first to propose and demonstrate a viable solution for real-time foot-tracking as well as other related biomechanics problems.

NavSol real-time tracking system is capable of localizing personnel inside buildings or other GPS denied environments without the need of using any external reference. The NavSol system can precisely pinpoint the location of a person in "virtually" any environment without any pre-setup, making it ideal for time critical applications.

The NavSol real-time tracking device was successfully demonstrated in October 2018, during the Urban Navigation competition organized by the USA DOD and the Israeli MOD at the military training installations in Tzeelim, Israel

The further development of the NavSol technology required by this proposal can be absorbed by the existing NavSol team (three engineers, one executive, and State of Michigan funded mentors and advisors) and structure without the need for additional staff, equipment or facilities.

NavSol has been funded using private investment to date and is in the process of raising equity capital, for which the company is receiving advise sponsored by the State of Michigan through the Michigan Small Business Development Center and the Michigan Economic Development Corporation.

L. Project Budget

Project budget files for each company activities, Elbit and NavSol, are attached to this proposal.

M. Risk Analysis

Elbit Systems and NavSol will take advantage of their existing functions and resources for the design and development of this solution, therefore we consider the technological and financial risks to be very low.

TABLE 1A

Risk #	Name/Description	Ranking	Impact		
			Duration ¹	Budget ²	Commercialization Potential ³
1	Overcome multipath at indoor environment	Low	Medium	Medium	Medium
2	Boot Inertial sensors accuracy	Low	Medium	Medium	Medium
3	Bluetooth Communication	Medium	Medium	Medium	Medium
4	Fusion algorithm	Low	Medium	Medium	Medium
5					

TABLE 1B

Risk #	Name/Description	Type*
1	RF Ranging module will overcome multipath environments, to get an accurate TOA calculations	T
2	A user boot, assemble with the inertial sensors, will provide accurate results in different user walking scenarios	T
3	Bluetooth communication, between the boot sensor and SmarTrack device, will have no disconnection during all walking scenarios	T
4	Desired system accuracy is reached with the fused technologies.	E
5		

*Type: Technical (T), Project Management/Resources (M), External to the Project (E)

N. Sundry Information- Mandatory

- a) Venue for the applicable law governing the CPFA between the companies and the Foundation, i.e., one of the States of the Union or Israel, as agreed upon by the companies:

Israel

- b) Name, direct telephone number, e-mail address and position of the assigned Project Manager from each company.

Elbit Systems C4I and Cyber LTD

Dima Volovich
Program Manager,
+972-773603810
Dima.volovich@elbitsystems.com

NavSol LLC

Lauro Ojeda
General Manager,
+1-734-2235904
lojeda@imuwear.

- c) Name, direct telephone number, e-mail address of the assigned Fiscal Information Official from each company.

Elbit Systems C4I and Cyber LTD

Cohen Yossi
CTO, Elbit Systems C4I and Cyber
+972-98898095
Yosef.Cohen@elbitsystems.com

NavSol LLC

Lauro Ojeda
General Manager,
+1-734-2235904
lojeda@imuwear.com

- d) Company's Certificate of Incorporation

Attached to this proposal

- e) Details of bank accounts to enable the Foundation to transfer the conditional grant payments to the companies. Specifically, for each company.

Elbit Systems C4I and Cyber LTD

- Name of account: Elbit Systems C4I and Cyber LTD
- Account number: **604830**
- Name of bank, branch number: Bank Hapoalim B.M Main branch #600
- Complete bank address: 26 Harokmim st. Holon, Israel
- Swift code : **poalilit**
- IBAN number : # IL68-0126-0000-0000-0604830

NavSol

- Name on the account: Navigation Solutions
- Bank name: University of Michigan Credit Union
- Bank address: 340 E. Huron, Ann Arbor, MI 48104
- Account number: 8001152233
- Routing number: 2724-7654-3

O. Certificates of Incorporation

Michigan Department of Labor & Economic Growth

Filing Endorsement

This is to Certify that the ARTICLES OF ORGANIZATION (DOMESTIC L.L.C.)

for

NAVIGATION SOLUTIONS, LLC

ID NUMBER: D11036

received by facsimile transmission on November 21, 2006 is hereby endorsed

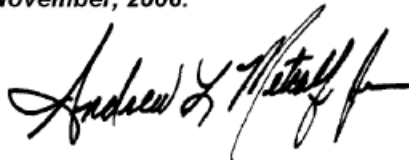
Filed on November 21, 2006 by the Administrator.

The document is effective on the date filed, unless a subsequent effective date within 90 days after received date is stated in the document.



Sent by Facsimile Transmission 06325

In testimony whereof, I have hereunto set my hand and affixed the Seal of the Department, in the City of Lansing, this 21ST day of November, 2006.



, Director

Bureau of Commercial Services

משרד המשפטים
MINISTRY OF JUSTICE



מדינת ישראל
STATE OF ISRAEL

01/09/2020

TO WHOM IT MAY CONCERN

As registrar of companies of the State of Israel, I hereby confirm that,
ELBIT SYSTEMS C4I AND CYBER LTD No. **514046283** is incorporated and
registered under Israeli law since **05/11/2007** .
Company status: active

Respectfully,
The Israeli Corporations Authority
Registrar of Companies and Partnerships



רחוב ירמיהו 39, מגדלי הבירה בנין 1, ירושלים 9446722, ת"ד 28093 ירושלים 9128002
טלפון: *5601 <http://Taagidim.justice.gov.il>
שעות קבלת קהל: ימים א', ב', ד', ה' 12:30-08:30; יום ג' הפקדת מסמכים בלבד (בהודעת מידע) החתום אלקטרונית,
מהווה העתק של מסמך (מקור או העתק) המצוי ביום החתימה בתיק התאגיד ברשות התאגידים